

# **Free and Forced Vibrations of Thick Elastic Plates by Meshless Local Petrov-Galerkin Method**

**R. C. Batra(a), L. F. Qian(b) and L. M. Chen(b)**

(a) Department of Engineering Science and Mechanics, M/C 0219  
Virginia Polytechnic Institute and State University  
Blacksburg, VA 24061, USA

(b) Nanjing University of Science and Technology  
Nanjing 210094, P.R. China

We have used the Batra-Vidoli higher order shear and normal deformable plate theory to analyze free and forced vibrations of linear elastic anisotropic and homogeneous thick plates under different boundary conditions by using a meshless local Petrov-Galerkin method. Computed results for simply supported plates are found to match very well with the available analytical solutions. Natural frequencies and through-the-thickness distributions of the transverse shear and the transverse normal stresses computed with equations of the 5<sup>th</sup> order plate theory have been found to match very well their analytical values. No locking phenomenon is observed and all of the domain and line integrals are evaluated by 8 x 8 and 8 integration points.

## References:

- R. C. Batra and S. Vidoli, Higher-order piezoelectric plate theory derived from a mixed variational principle, *AIAA J.*, 40, 91-104, 2002.
- R. c. Batra, S. Vidoli and F. Vestroni, Plane wave solutions and modal analysis in higher order shear and normal deformable plate theories, *J. Sound and Vibrations*, 257, 63-88, 2002.
- L. F. Qian, R. C. Batra and L. M. Chen, Elastostatic deformations of a thick plate by using a higher-order shear and normal deformable plate theory and two meshless local Petrov-Galerkin methods, *Computer Modeling in Engineering and Sciences*, 4, 161-176, 2003.
- L. F. Qian, R. C. Batra and L. M. Chen, Free and forced vibrations of thick rectangular plates by using a higher-order shear and normal deformable plate theory and meshless local Petrov-Galerkin method, *Submitted for publication*.
- .